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PATENT
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| Applicant(s): | LEE et al. | Group Art Unit: | 1765 |
| Serial No.: | 09/560,268 | Examiner: | Duy Deo |
| Confirmation No.: | 2517 | | |
| Filed: | April 26, 2000 | | |

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE

## APPEAL BRIEF

MS Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicants present this Appeal Brief in support of the appeal from the final rejection of claims 64-65 and 67-95 as indicated in the Notice of Appeal filed in the above-identified patent application on 4 March 2003.

This Brief is being submitted in triplicate, as set forth in 37 C.F.R. §1.192(a). Please charge Deposit Account No. 13-4895 in the amount of $320.00 to cover the fee for filing a brief in support of an appeal.

## REAL PARTY IN INTEREST

The real party in interest is Micron Technology, Inc. of Boise, Idaho, as evidenced by the assignment recorded at Reel 8868 Frame 0451 of the parent application (U.S. Serial No. 08/914,935 filed 20 August 1997).

## RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences pending in connection with any related

applications.

## STATUS OF CLAIMS

Claims 64-65 and 67-95 are pending. The final rejection of claims 64-65 and 67-95 is appealed. All of pending claims 64-65 and 67-95 are presented in attached Appendix A.

## SUMMARY OF THE INVENTION

The present invention provides a single etching composition for use in etching cobalt and metal nitride in integrated circuit fabrication. For example, as illustrated in Figure 3, a metal nitride layer 24 is shown on a substrate assembly 22 along with regions of cobalt silicide 27 on first portions of the metal nitride layer 27 and regions of cobalt 26 on second portions of the metal nitride layer 27 (regions of metal nitride 24 that underlie cobalt 26). As shown in Figure 4, using the single etching composition of the present invention, the cobalt 26 and the second portions of the metal nitride layer 24 underlying the cobalt are removed leaving the first portions of the metal nitride layer 23 underlying the cobalt silicide regions 27 unetched, as illustrated in Figure 5.

A single etching composition according to the present invention for performing this process is described in the pending claims. For example, in one embodiment as described in claim 64, the etching composition includes a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:10 (mineral acid:peroxide:deionized water).

In another embodiment as described in claim 68, the etching composition includes a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water). Further, the composition has an etch rate greater than about 1000 Å/minute for cobalt.

In another embodiment as described in claim 73, the etching composition includes a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water). Further,

the composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride.

Yet further, in another embodiment as described in claim 77, the etching composition includes a mineral acid, a peroxide, and deionized water. This etch composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride and an etch rate greater than about 1000 Å/minute for cobalt.

Still further, in yet another embodiment as described in claim 79, the etching composition includes a mineral acid, a peroxide, and deionized water. This etch composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride.

In addition, another etch composition is described in claim 84. This etching composition includes a mineral acid, a peroxide, and deionized water; the composition having an etch rate greater than about 1000 Å/minute for cobalt.

Further, claim 89 presents another etching composition, wherein the composition consists essentially of a mineral acid, a peroxide, and deionized water. In this embodiment, the composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride and an etch rate greater than about 1000 Å/minute for cobalt.

Finally, another etching composition is described in claim 94. This composition includes a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:10 (mineral acid:peroxide:deionized water). The mineral acid is selected from the group consisting of HCl diluted to 37% by weight in deionized water, $HNO_3$ diluted to 70% by weight in deionized water, $H_2SO_4$ diluted to 96% by weight in deionized water, $H_3PO_4$ diluted to 85% by weight in deionized water, and HF diluted to 49% by weight in deionized water. The peroxide is selected from the group consisting of hydrogen peroxide diluted to 29% by weight in deionized water, and ozone.

Further, suitable mineral acids for the single etching composition include HCl, $HNO_3$, $H_2SO_4$, $H_3PO_4$, and dilute HF (i.e., about or more dilute than 200:1 $H_20$:HF). A preferred mineral acid is HCl.

Yet further, suitable peroxides include hydrogen peroxide and potentially ozone. Preferably, hydrogen peroxide is used.

## ISSUES

1. Whether claims 68-70, 72-75, 77-81, 83-86, 88-91 and 93 are unpatentable under 35 U.S.C. §102(e) as being anticipated by Shiramizu (U.S. Patent No. 6,116,254).

2. Whether claims 64-65, 67, 71, 76, 82, 87, and 92-95 are unpatentable under 35 U.S.C. §103(a) in view of Shiramizu (U.S. Patent No. 6,116,254).

3. Whether claims 64-65 and 67-95 are unpatentable under 35 U.S.C. §103(a) in view of Nakano (U.S. Patent No. 6,110,839) and Shiramizu (U.S. Patent No. 6,116,254).

## GROUPING OF CLAIMS

For purposes of this appeal, with respect to issue 1, claims 68-70, 72-75, 77-81, 83-86, 88-91 and 93 stand or fall together.

For purposes of this appeal, with respect to issue 2, claims 64-65, 67, 71, 76, 82, 87, and 92-95 stand or fall together.

For purposes of this appeal, with respect to issue 3, claims 64-65 and 67-95 stand or fall together.

## ARGUMENTS

**I. Whether claims 68-70, 72-75, 77-81, 83-86, 88-91, and 93 are unpatentable under 35 U.S.C. §102(e) as being anticipated by Shiramizu (U.S. Patent No. 6,116,254).**

Claims 68-70, 72-75, 77-81, 83-86, 88-91, and 93 were rejected under 35 U.S.C. §102(e) as being anticipated by Shiramizu (U.S. Patent No. 6,116,254). Applicants respectfully traverse this rejection and request review and reversal by the Board.

For anticipation under 35 U.S.C. §102, the reference must teach every aspect of the claimed invention either explicitly or implicitly (M.P.E.P. §706.02). "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegall Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the . . . claim." Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Claims 68-70, 72-75, 77-81, 83-86, 88-91, and 93 are not anticipated by Shiramizu because this reference does not teach each and every element of claims 68-70, 72-75, 77-81, 83-86, 88-91, and 93. For example, each of independent claims 68, 73, 77, 79, 84, and 89 recite that the claimed etching compositions include a specified etch rate. Claims 68 and 84 recite that the etching composition has an etch rate greater than about 1000 Å/minute for cobalt. Claims 73 and 79 recite that the etching composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride. Claims 77 and 89 recite that the etching composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride and an etch rate greater than about 1000 Å/minute for cobalt.

In contrast to independent claims 68, 73, 77, 79, 84, and 89, Shiramizu does not teach any etch rates for its disclosed cleaning solution. The Examiner, however, alleges that the cleaning solution taught by Shiramizu would inherently have a metal nitride etch rate of about 50 Å/minute to 250 Å/minute and a cobalt etch rate greater than about 1000 Å/minute because it is made from essentially the same concentration of each chemical as that of the claimed invention.

However, to establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. *In re Robertson*, 49 U.S.P.Q.2d 1949, 1950-51 (Fed. Cir. 1999); *see also Crown Operations Int'l Ltd. v. Solutia Inc.*, 62 U.S.P.Q.2d 1917 (Fed. Cir. 2002). Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. *Id.*

In *Crown Operations*, the Federal Circuit refused to adopt the approach suggested by plaintiffs that "if a prior art reference disclosed the same structure as claimed by a patent, the resulting property . . . should be assumed." *See Crown Operations Int'l Ltd. v. Solutia Inc.*, 62 U.S.P.Q.2d at 1922.

In this case, Applicants submit that the etch rates claimed by the present invention are not necessarily present in the teachings of Shiramizu for at least the following reasons. First, as stated above in *Crown Operations*, just because Shiramizu may disclose a cleaning solution having a similar structure as the etching composition claimed in the present invention does not necessarily imply that the cleaning solution of Shiramizu etches either metal nitride or cobalt at the claimed etch rates. As stated above, Shiramizu is silent regarding etch rates or etch rates for metal nitride and cobalt. Further, one skilled in the art would not recognize such etch rates in Shiramizu.

Equating the cleaning solution of Shiramizu to the composition of the present invention does not necessarily provide a solution that has the etch rates for the particular materials as claimed. For example, the etch rates provided in the claims (e.g., greater than about 1000 Å/minute for cobalt) are described in the specification as being preferred etch rates for the single solution. Because the etch rates are only preferred etch rates, it does not necessarily follow that all the claimed compositions (e.g., a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water)) will have an etch rate that falls in that preferred etch rate range (e.g., greater than about 1000 Å/minute for cobalt). In other words, there may be compositions according to the present invention that do not etch at the preferred rates (e.g., greater than about 1000 Å/minute for cobalt). As such, equating the cleaning solution of Shiramizu to the composition of the present invention does not necessarily provide an etch rate in the preferred range.

In other words, even though Shiramizu recites similar components used in the etching composition taught in claims 68, 73, 77, 79, 84, and 89, nothing in Shiramizu would lead one skilled in the art to an understanding that the specific etch rates for either cobalt and/or metal

nitride are necessarily present. Specifically, there is no teaching in Shiramizu that the recited cleaning solution could provide an etch rate approaching those recited in claims 68, 73, 77, 79, 84, and 89. Just because Shiramizu has similar components in the cleaning solution does not necessarily mean that this solution can necessarily be used to achieve specific etch rates for specific materials as recited in claims 68, 73, 77, 79, 84, and 89. As a result, one skilled in the art would not recognize that an etch rate as recited in the claims would necessarily be present with the composition recited in Shiramizu.

As Shiramizu fails to recite etch rates or etch rates of metal nitride and cobalt, it would appear that the Examiner is relying only upon a probability in asserting that the composition recited in Shiramizu provides etch rates as described in the pending claims. As discussed above, however, probabilities are not sufficient for supporting the Examiner's inherency argument.

Further, Shiramizu teaches cleaning methods and cleaning systems for cleaning a semiconductor substrate, not etching compositions for etching metal nitride and/or cobalt as claimed by the present invention. In other words, one skilled in the art would not recognize that the cleaning solution taught by Shiramizu would be able to etch metal nitrides and/or cobalt at the etch rates claimed because cleaning solutions and etching solutions perform different functions.

Specifically, the section of Shiramizu pointed to by the Examiner teaches a cleaning process for removing metallic contaminants on the surface of a semiconductor substrate. *See* Shiramizu, column 1, lines 26-28. The term "metallic" is defined as "pertaining to metals in their uncombined forms." Grant et al., *Chemical Dictionary*, 5th ed., pg. 364 (1987). In other words, Shiramizu teaches a cleaning process (not an etching process as described according to the present invention) for removing only metal contaminants in their uncombined form. Therefore, one skilled in the art would not recognize that the cleaning solution allegedly taught by Shiramizu would etch metal nitrides at the rates claimed by the present invention.

Finally, the Examiner asserts that Applicants' arguments stating that the Shiramizu solution does not necessarily have the same etch rate as the claims is found unpersuasive because there is no factual evidence to support such arguments. Applicants submit that Examiner must

provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art. *Ex parte Levy*, 17 U.S.P.Q.2d 1461,1464 (Bd. Pat. App. & Inter. 1990). Based on the arguments presented above, Applicants respectfully submit that the Examiner has not met the burden to prove that the asserted etch rates are necessarily present in Shiramizu (e.g., in view of the etch rates of the present invention being described in the specification as preferred rates).

For at least the above reasons, Applicants submit that the claimed etch rates are not necessarily present in Shiramizu, and therefore, the claimed etch rates are not inherently taught by Shiramizu. Because Shiramizu does not teach each and every element of independent claims 68, 73, 77, 79, 84, and 89, such claims are not anticipated by Shiramizu.

In regard to dependent claims 69-70, 72, 74-75, 78, 80-81, 83, 85-86, 88, 90-91, and 93, which depend from one of independent claims 68, 73, 77, 79, 84, and 89, such claims are not anticipated by Shiramizu for the same reasons as presented above for independent claims 68, 73, 77, 79, 84, and 89. In addition, claims 69-70, 72, 74-75, 78, 80-81, 83, 85-86, 88, 90-91, and 93 each recite additional elements that further support patentability when combined with independent claims 68, 73, 77, 79, 84, and 89.

## II. Whether claims 64-65, 67, 71, 76, 82, 87, and 92-95 are unpatentable under 35 U.S.C. §103(a) in view of Shiramizu (U.S. Patent No. 6,116,254).

Claims 64-65, 67, 71, 76, 82, 87, and 92-95 were rejected under 35 U.S.C. §103(a) in view of Shiramizu (U.S. Patent No. 6,116,254). Applicants respectfully traverse this rejection and request review and reversal by the Board.

Applicants submit that claims 64-65, 67, 71, 76, 82, 87, and 92-95 are not *prima facie* obvious for at least the following reasons.

Claims 64-65, 67 and 94-95

Claims 64 and 94 are not *prima facie* obvious in view of Shiramizu for several reasons.

First, Shiramizu fails to teach or suggest all the elements recited in claims 64 and 94. For example, Shiramizu fails to teach or suggest an etching composition that comprises a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:10 (mineral acid:peroxide:deionized water), as recited in claims 64 and 94.

Second, there is no motivation or suggestion given to modify the disclosed cleaning solution such that it includes a range of about 1:1:25 to about 1:1:10 as recited in claims 64 and 94. Particularly, one skilled in the art would not be motivated to modify the cleaning solution of Shiramizu to etch metal nitrides and/or cobalt as is provided by the present invention.

Finally, the Examiner has asserted that "one skilled in the art would find it obvious to determine the chemical ratio through test runs depending on what type of material the solution is used on, in order to achieve a solution to remove metal contaminations or etch metal with an expected of reasonable result." In other words, the Examiner asserts, essentially, that it would have been "obvious to try" different chemical ratios through "test runs" to arrive at the chemical ratios recited in pending claims 64 and 94.

Applicants respectfully submit, however, that "obvious to try" is an impermissible standard to use in an obviousness determination. *In re Antonie*, 559 F.2d 618, 195 U.S.P.Q. 6 (C.C.P.A. 1977); *In re Tomlinson et al.*, 363 F.2d 928, 150 U.S.P.Q. 623(C.C.P.A. 1966). There must be a suggestion or teaching in the prior art that Applicants' claimed invention could or should be prepared. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (C.A.F.C. 1991); *In re O'Farrell*, 853 F.2d 894, 7 U.S.P.Q.2d 1673 (C.A.F.C. 1988). It appears that it is only in hindsight, e.g., picking and choosing among the disclosure of the cited art with knowledge of Applicants' disclosure, that the Examiner can arrive at the conclusion that Applicants' invention is obvious.

Claims 65 and 67 are patentable by reason of their dependency on patentable claim 64.

Claim 95 is patentable by reason of its dependency on patentable claim 94.

*Claims 71, 76, 82, 87, and 92-93*

Claims 71, 76, 82, 87, and 92-93 are not *prima facie* obvious because Shiramizu does not teach or suggest all of the elements of such claims. For example, by reason of their respective dependencies, claims 71, 76, 82, 87, and 92-93 each recite etch rates for metal nitride and/or cobalt. For example, claims 71 and 87 recite that the claimed etching composition has an etch rate greater than about 1000 Å/minute for cobalt. Claims 76 and 82 each include the element that the etching composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride. Further, claims 92-93 recite that the etching composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride and an etch rate greater than about 1000 Å/minute for cobalt. As stated above, Shiramizu is silent regarding etch rates or etch rates for etching metal nitride and/or cobalt. Therefore, Shiramizu does not teach all of the elements of claims 71, 76, 82, 87, and 92-93.

Further, as described above, one skilled in the art would not be motivated to modify the cleaning solution taught by Shiramizu such that it etched metal nitride and/or cobalt at the recited etch rates.

For at least the above reasons, Applicants submit that claims 71, 76, 82, 87, and 92-93 are not *prima facie* obvious in view of Shiramizu. Reconsideration and withdrawal of this rejection are, therefore, respectfully requested.

## III. Whether claims 64-65 and 67-95 are unpatentable under 35 U.S.C. §103(a) in view of Nakano (U.S. Patent No. 6,110,839) and Shiramizu (U.S. Patent No. 6,116,254).

Claims 64-65 and 67-95 were rejected under 35 U.S.C. §103(a) in view of Nakano (U.S. Patent No. 6,110,839) and Shiramizu (U.S. Patent No. 6,116,254). Applicants respectfully traverse this rejection and request review and reversal by the Board.

Applicants submit that claims 64-65 and 67-95 are not *prima facie* obvious because the cited references do not teach or suggest all of the elements of claims 64-65, and 67-95. As stated above, Applicants submit that Shiramizu does not teach all of the elements of claims 64-65 and

67-95. For example, Shiramizu does not teach an etching composition that includes a ratio in a range of about 1:1:25 to about 1:1:10 (e.g., claim 64). Further, Shiramizu does not teach etch rates for etching cobalt (e.g., claim 68), etching metal nitrides (e.g., 73), or etching both cobalt and metal nitride (e.g., claim 77).

The Examiner, however, alleges that Nakano et al. shows an etching composition that includes a ratio in a range of about 1:1:25 to about 1:1:10. It is alleged that Nakano et al. shows a composition that includes a ratio of 1:1:10 and as such the etch rates claimed are inherent therein.

Even if such a range is shown, equating the cleaning solution of Nakano et al. to the composition of the present invention does not necessarily provide a solution that has the etch rates for the particular materials as claimed. For example, the etch rates provided in the claims (e.g., greater than about 1000 Å/minute for cobalt) are described in the specification as being preferred etch rates for the single solution. Because the etch rates are only preferred etch rates, it does not necessarily follow that all the claimed compositions (e.g., a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water)) will have an etch rate that falls in that preferred etch rate range (e.g., greater than about 1000 Å/minute for cobalt). In other words, there may be compositions according to the present invention that do not etch at the preferred rates (e.g., greater than about 1000 Å/minute for cobalt). As such, equating the cleaning solution of Shiramizu to the composition of the present invention does not necessarily provide an etch rate in the preferred range.

In other words, even though Nakano et al. recites similar components used in the etching composition, nothing in Nakano et al. would lead one skilled in the art to an understanding that the specific etch rates for either cobalt and/or metal nitride are necessarily present. Just because Nakano et al. has similar components in the cleaning solution does not necessarily mean that this solution can necessarily be used to achieve specific etch rates for specific materials as recited in the claims. As a result, one skilled in the art would not recognize that an etch rate as recited in the claims would necessarily be present with the composition recited in Nakano et al.

Applicants submit that the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flow from the teachings of the applied prior art. *Ex parte Levy*, 17 U.S.P.Q.2d 1461,1464 (Bd. Pat. App. & Inter. 1990). Based on the arguments presented above, Applicants respectfully submit that the Examiner has not met the burden to prove that the asserted etch rates are necessarily present in Nakano et al. (e.g., in view of the etch rates of the present invention being described in specification as preferred rates).

## CONCLUSION

Applicants respectfully submit that pending claims 64-65 and 67-95 are patentable. Review and reversal of the rejections is respectfully requested.

Respectfully submitted,

LEE et al.

By their attorneys,

Mueting, Raasch & Gebhardt, P.A.
P.O. Box 581415
Minneapolis, MN 55458-1415
(612) 305-1220

5 May 2003
Date

By:
Mark J. Gebhardt
Reg. No. 35,518
Direct Dial: (612) 305-1216

CERTIFICATE UNDER 37 CFR §1.8:
The undersigned hereby certifies that this paper is being deposited with the United States Postal Service as first class mail, in an envelope addressed to: MS- Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 5th day of May, 2003.

By:
Name: Mark J. Gebhardt

Claims 64-65 and 67-95 are reproduced below.

64. An etching composition, the composition comprising a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:10 (mineral acid:peroxide:deionized water).

65. The etching composition according to claim 64, wherein the mineral acid is HCl and the peroxide is hydrogen peroxide.

67. The etching composition according to claim 64, wherein the mineral acid is selected from the group consisting of HCl, $HNO_3$, $H_2SO_4$, $H_3PO_4$, and HF.

68. An etching composition, the composition comprising a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water), wherein the composition has an etch rate greater than about 1000 Å/minute for cobalt.

69. The etching composition according to claim 68, wherein the mineral acid is HCl.

70. The etching composition according to claim 68, wherein the peroxide is hydrogen peroxide.

71. The etching composition according to claim 68, wherein the ratio is in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:10 (mineral acid:peroxide:deionized water).

72. The etching composition according to claim 68, wherein the composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride.

73. An etching composition, the composition comprising a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water), wherein the composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride.

74. The etching composition according to claim 73, wherein the mineral acid is HCl.

75. The etching composition according to claim 73, wherein the peroxide is hydrogen peroxide.

76. The etching composition according to claim 73, wherein the ratio is in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:10 (mineral acid:peroxide:deionized water).

77. An etching composition, the composition comprising a mineral acid, a peroxide, and deionized water, wherein the composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride and an etch rate greater than about 1000 Å/minute for cobalt.

78. The etching composition according to claim 77, wherein the mineral acid is HCl and the peroxide is hydrogen peroxide.

79. An etching composition, the composition comprising a mineral acid, a peroxide, and deionized water, wherein the composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride.

80. The composition according to claim 79, wherein the mineral acid is HCl and the peroxide is hydrogen peroxide.

81. The etching composition according to claim 80, wherein the composition comprises a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water).

82. The etching composition according to claim 81, wherein the composition comprises a ratio in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:10 (mineral acid:peroxide:deionized water).

83. The composition according to claim 79, wherein the mineral acid is selected from the group consisting of HCl, $HNO_3$, $H_2SO_4$, $H_3PO_4$, and HF.

84. An etching composition, the composition comprising a mineral acid, a peroxide, and deionized water, wherein the composition has an etch rate greater than about 1000 Å/minute for cobalt.

85. The composition according to claim 84, wherein the mineral acid is HCl and the peroxide is hydrogen peroxide.

86. The etching composition according to claim 85, wherein the composition comprises a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water).

87. The etching composition according to claim 86, wherein the composition comprises a ratio in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:10 (mineral acid:peroxide:deionized water).

88. The composition according to claim 84, wherein the mineral acid is selected from the group consisting of HCl, $HNO_3$, $H_2SO_4$, $H_3PO_4$, and HF.

89. An etching composition, the composition consisting essentially of a mineral acid, a peroxide, and deionized water, wherein the composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride and an etch rate greater than about 1000 Å/minute for cobalt.

90. The composition according to claim 89, wherein the mineral acid is HCl and the peroxide is hydrogen peroxide.

91. The composition according to claim 90, wherein the composition comprises a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water).

92. The composition according to claim 91, wherein the ratio is in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:10 (mineral acid:peroxide:deionized water).

93. The composition according to claim 89, wherein the mineral acid is selected from the group consisting of HCl, $HNO_3$, $H_2SO_4$, $H_3PO_4$, and HF.

94. An etching composition, the composition comprising a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:10 (mineral acid:peroxide:deionized water), wherein the mineral acid is selected from the group consisting of HCl diluted to 37% by weight in deionized water, $HNO_3$ diluted to 70% by weight in deionized water, $H_2SO_4$ diluted to 96% by weight in deionized water, $H_3PO_4$ diluted to 85% by weight in deionized water, and HF diluted to 49% by weight in deionized water, wherein the peroxide is selected from the group consisting of hydrogen peroxide diluted to 29% by weight in deionized water, and ozone.

95. The etching composition according to claim 94, wherein the mineral acid is HCl and the peroxide is hydrogen peroxide.